WHAT IS CLAIMED IS:

1. A 4-way power splitter/combiner circuit for use with power amplifiers, comprising:

a splitter circuit, further comprising

an input port;

a first node;

a second node;

a first splitter transmission line having an impedance Z_{S1} and an electrical length Φ_{S1}, said first splitter transmission line for connecting said input port to said first node;

a second splitter transmission line having an impedance Z_{S2} and an electrical length Φ_{S2}, said second splitter transmission line for connecting said input port to said second node;

a first amplifier input;

a second amplifier input;

a third amplifier input;

a fourth amplifier input;

a third splitter transmission line having an impedance Z_{S3} and an electrical length Φ_{S3}, said third splitter transmission line for connecting said first node to said first amplifier input;

a fourth splitter transmission line having an impedance Z_{S4} and an electrical length Φ_{S4}, said fourth splitter transmission line for connecting said first node to said second amplifier input;

a fifth splitter transmission line having an impedance Z_{S5} and an electrical length Φ_{S5}, said fifth splitter transmission line for connecting said second node to said third amplifier input;

a sixth splitter transmission line having an impedance Z_{S6} and an electrical length Φ_{S6}, said sixth splitter transmission line for connecting said second node to said fourth amplifier input;

a combiner circuit, further comprising

an output port;

a third node;

a fourth node;

a first combiner transmission line having an impedance Z_{C1} and an electrical length Φ_{C1}, said first combiner transmission line for connecting said output port to said third node;

a second combiner transmission line having an impedance Z_{C2} and an electrical length Φ_{C2}, said second combiner transmission line for connecting said output port to said fourth node;

a first amplifier output;

a second amplifier output;

a third amplifier output;

a fourth amplifier output;

a third combiner transmission line having an impedance Z_{C3} and an electrical length Φ_{C3}, said third combiner transmission line for connecting said third node to said first amplifier output;

a fourth combiner transmission line having an impedance Z_{C4} and an electrical length Φ_{C4}, said fourth combiner transmission line for connecting said third node to said second amplifier output;

a fifth combiner transmission line having an impedance Z_{C5} and an electrical length Φ_{C5}, said fifth combiner transmission line for connecting said fourth node to said third amplifier output;

a sixth combiner transmission line having an impedance Z_{C6} and an electrical length Φ_{C6}, said sixth combiner transmission line for connecting said fourth node to said fourth amplifier output;

wherein said first amplifier input and said first amplifier output together define a first amplifier port, said second amplifier input and said second amplifier output together define a second amplifier port, said third amplifier input and said third amplifier output together define a third amplifier port, and said fourth amplifier input and said fourth amplifier output together define a fourth amplifier port, each said amplifier port for receiving an amplifier;

wherein said first amplifier port, said second amplifier port, said third amplifier port and said fourth amplifier port collectively accept one to four amplifiers; and

wherein the phase shift of each of said combiner transmission lines and each of said splitter transmission lines is selected to produce an in-phase signal at said output port.

2. The 4-way power splitter/combiner circuit of claim 1 wherein the electrical lengths of said transmission lines satisfy the following equations:

$\Phi_{S1} + \Phi_{S3} = \Phi_{S1} + \Phi_{S4} = X$;

$\Phi_{S2} + \Phi_{S5} = \Phi_{S2} + \Phi_{S6} = Y$;

$\Phi_{C1} + \Phi_{C3} = \Phi_{C1} + \Phi_{C4} = X'$;

$\Phi_{C2} + \Phi_{C5} = \Phi_{C2} + \Phi_{C6} = Y'$;

$|X - Y| = |X' - Y'| = 90$ degrees; and

$(X - Y) = (Y' - X')$.

3. The 4-way power splitter/combiner circuit of claim 1, further comprising at least one amplifier.

4. The 4-way power splitter/combiner circuit of claim 3 wherein the impedance presented by said input port and said output port are between approximately 35 Ω and approximately 71Ω.

5. The 4-way power splitter/combiner circuit of claim 3 wherein said at least one amplifier comprises a first amplifier in said second amplifier port.

6. The 4-way power splitter/combiner circuit of claim 3 wherein said at least one amplifier comprises a first amplifier in said first amplifier port.

7. The 4-way power splitter/combiner circuit of claim 6 wherein said at least one amplifier further comprises a second amplifier in said second amplifier port.

8. The 4-way power splitter/combiner circuit of claim 7 wherein said at least one amplifier further comprises a third amplifier in said fourth amplifier port.

9. The 4-way power splitter/combiner circuit of claim 7 wherein said at least one amplifier further comprises a third amplifier in said third amplifier port.

10. The 4-way power splitter/combiner circuit of claim 9 wherein said at least one amplifier further comprises a fourth amplifier in said fourth amplifier port

11. A 4-way power splitter/combiner circuit for use with power amplifiers, comprising:

an input port;

a first splitter transmission line connecting a first amplifier input to a first splitter node, said first splitter transmission line comprising a first splitter impedance transformer segment having impedance of 59.46 Ω and electrical length of 90° and a first splitter phase matching segment having impedance of 50 Ω and electrical length of 270°;

a second splitter transmission line connecting a second amplifier input to said first splitter node, said second splitter transmission line comprising a second splitter impedance

transformer segment and a second splitter phase matching segment, each of said second splitter impedance transformer segment and said second splitter phase matching segment having impedance and electrical length substantially identical to that of said first splitter impedance transformer and said splitter first phase matching segment;

a third splitter transmission line connecting a third amplifier input to a second splitter node, said third splitter transmission line having impedance of 50 Ω and electrical length of 180°;

a fourth splitter transmission line connecting a fourth amplifier input to said second splitter node, said fourth splitter transmission line having impedance and electrical length substantially identical to that of said third splitter transmission line;

a fifth splitter transmission line connecting said second splitter node to said input port, said fifth splitter transmission line comprising a third splitter impedance transformer segment having impedance of 38 Ω and electrical length of 90°, and a fourth splitter impedance transformer segment having impedance of 64 Ω and electrical length of 90°;

a sixth splitter transmission line connecting said first splitter node to said input port, said sixth splitter transmission line having impedance of 50 Ω and electrical length of 90°;

an output port;

a first combiner transmission line connecting a first amplifier output to a first combiner node, said first combiner transmission line comprising a first combiner impedance transformer segment having impedance of 59.46 Ω and electrical length of 90° and a first combiner phase matching segment having impedance of 50 Ω and electrical length of 90°;

a second combiner transmission line connecting a second amplifier output to said first combiner node, said second combiner transmission line comprising a second combiner impedance transformer segment and a second combiner phase matching segment, each of said second combiner impedance transformer segment and said second combiner phase matching segment having impedance and electrical length substantially identical to that of said first combiner impedance transformer and said combiner first phase matching segment;

a third combiner transmission line connecting a third amplifier output to a second combiner node, said third combiner transmission line having impedance of 50 Ω and electrical length of 180°;

a fourth combiner transmission line connecting a fourth amplifier output to said second combiner node, said fourth combiner transmission line having impedance and electrical length substantially identical to that of said third combiner transmission line;

a fifth combiner transmission line connecting said second combiner node to said output port, said fifth combiner transmission line comprising a third combiner impedance transformer segment having impedance of 38 Ω and electrical length of 90°, and a fourth combiner impedance transformer segment having impedance of 64 Ω and electrical length of 90°;

a sixth combiner transmission line connecting said first combiner node to said output port, said sixth combiner transmission line having impedance of 50 Ω and electrical length of 90°;

wherein said first amplifier input and said first amplifier output together define a first amplifier port for receiving an amplifier, said second amplifier input and said second amplifier output together define a second amplifier port for receiving an amplifier,

said third amplifier input and said third amplifier output together define a third amplifier port for receiving an amplifier, said fourth amplifier input and said fourth amplifier output together define a fourth amplifier port for receiving an amplifier; and wherein 1-4 power amplifiers may be inserted in said amplifier ports to provide an amplified signal.

12. A 4-way power splitter/combiner circuit for use with power amplifiers, comprising:

a splitter circuit, further comprising

an input port;

a first node;

a second node;

a first splitter transmission line for connecting said input port to said first node;

a second splitter transmission line for connecting said input port to said second node;

a first amplifier input;

a second amplifier input;

a third amplifier input;

a fourth amplifier input;

a third splitter transmission line for connecting said first node to said first amplifier input;

a fourth splitter transmission line for connecting said first node to said second amplifier input;

a fifth splitter transmission line for connecting said second node to said third amplifier input;

a sixth splitter transmission line for connecting said second node to said fourth amplifier input;

a combiner circuit, further comprising

an output port;

a third node;

a fourth node;

a first combiner transmission line for connecting said output port to said third node;

a second combiner transmission line for connecting said output port to said fourth node;

a first amplifier output;

a second amplifier output;

a third amplifier output;

a fourth amplifier output;

a third combiner transmission line for connecting said third node to said first amplifier output;

a fourth combiner transmission line for connecting said third node to said second amplifier output;

a fifth combiner transmission line for connecting said fourth node to said third amplifier output;

a sixth combiner transmission line for connecting said fourth node to said fourth amplifier output;

wherein said first amplifier input and said first amplifier output together define a first amplifier port, said second amplifier input and said second amplifier output together define a second amplifier port, said third amplifier input and said third amplifier output together define a third amplifier port, and said fourth amplifier input and said fourth amplifier output together define a fourth amplifier port, each said amplifier port for receiving an amplifier;

wherein said splitter/combiner circuit accepts one to four amplifiers; and

wherein said splitter transmission lines and said combiner transmission lines have a plurality of electrical lengths; and

wherein the electrical lengths of each of said combiner transmission lines and each of said splitter transmission lines are selected to produce an in-phase signal at said output port.

13. The 4-way power splitter/combiner circuit of claim 12 further comprising an amplifier.

14. The 4-way power splitter/combiner circuit of claim 13 wherein said amplifier is populated in said first amplifier port.

15. The 4-way power splitter/combiner circuit of claim 13 wherein said amplifier is populated in said second amplifier port.

16. A 4-way power splitter/combiner circuit for use with power amplifiers, comprising:

a splitter circuit, further comprising

an input port;

a splitter node;

a first amplifier input;

a second amplifier input;

a third amplifier input;

a fourth amplifier input;

a first splitter transmission line having an impedance and an electrical length, said first splitter transmission line for connecting said input port to said splitter node;

a second splitter transmission line having an impedance and an electrical length, said second splitter transmission line for connecting said splitter node to said first amplifier input;

a third splitter transmission line having an impedance and an electrical length, said third splitter transmission line for connecting said splitter node to said second amplifier input;

a fourth splitter transmission line having an impedance and an electrical length, said fourth splitter transmission line for connecting said input port to said third amplifier input;

a fifth splitter transmission line having an impedance and an electrical length, said fifth splitter transmission line for connecting said input port to said fourth amplifier input;

a combiner circuit, further comprising

an output port;

a combiner node;

a first amplifier output;

a second amplifier output;

a third amplifier output;

a fourth amplifier output;

a first combiner transmission line having an impedance and an electrical length, said first combiner transmission line for connecting said output port to said combiner node;

a second combiner transmission line having an impedance and an electrical length, said second combiner transmission line for connecting said combiner node to said first amplifier output;

a third combiner transmission line having an impedance and an electrical length, said third combiner transmission line for connecting said combiner node to said second amplifier output;

a fourth combiner transmission line having an impedance and an electrical length, said fourth combiner transmission line for connecting said output port to said third amplifier output;

a fifth combiner transmission line having an impedance and an electrical length, said fifth combiner transmission line for connecting said output port to said fourth amplifier output;

wherein said first amplifier input and said first amplifier output together define a first amplifier port, said second amplifier input and said second amplifier output together define a second amplifier port, said third amplifier input and said third amplifier output together define a third amplifier port, and said fourth amplifier input and said fourth amplifier output together define a fourth amplifier port, each said amplifier port for receiving an amplifier;

wherein said splitter/combiner circuit accepts one to four amplifiers; and

wherein the electrical length of each of said combiner transmission lines and each of said splitter transmission lines is selected to produce an in-phase signal at said output port.

17. The 4-way power splitter/combiner circuit of claim 16 further comprising an amplifier.

18. The 4-way power splitter/combiner circuit of claim 17 wherein said amplifier is populated in said first amplifier port.